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Populations of the Tarnished Plant Bug, Bollworm, and Tobacco Budworm in Selected Cottonfields of Panola and Pontotoc Counties, Mississippi, 1977

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ILLUSTRATIONS

Populations of the Tarnished Plant Bug, Bollworm, and Tobacco Budworm in Selected Cottonfields of Panola and Pontotoc Counties, Mississippi, 1977

By W. P. Scott, J. W. Smith, and C. R. Parencia[1]

ABSTRACT

Populations were monitored by vacuum-machine sampling and examining plants to develop baseline data, refine techniques, and improve procedures for the Optimum Pest Management Trial in Panola County, initiated in 1978. Four fields of 20 in Panola County were planted to a nectariless cultivar; all other fields, including 10 in Pontotoc County, were planted to nectaried cultivars. Infestations of the tarnished plant bug were not severe enough to be of much concern, and only four fields were treated for control. Fields of the nectariless cultivar had somewhat lower populations than those of the nectaried cultivars. Populations of bollworms and tobacco budworms were light to moderate in these fields. Average insecticide applications of 3.9 and 1.6 per field were made in Panola and Pontotoc Counties, respectively, to control *Heliothis* spp., but three fields in Pontotoc County were not treated with any insecticide. Sampling of tarnished plant bugs by vacuum machine was more efficient than by counting, producing 3.5 and 2.9 times as many bugs in Panola and Pontotoc Counties, respectively. Index terms: cotton, *Heliothis virescens* (F.), *Heliothis zea* (Boddie), insect populations, insect sampling, insect surveys, *Lygus lineolaris* (Palisot de Beauvois), Mississippi, Panola County, Miss., Pontotoc County, Miss., vacuum sampling.

INTRODUCTION

The effect of infestations of the tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), on cotton production in the Delta States has been a matter of controversy (Laster 1976). Opinions among extension and research entomologists, consultants, cotton specialists, and producers range from "key pest insect" to "greatly exaggerated importance." In years when cotton plants make abnormal growth resulting in what is termed "crazy cotton," the tarnished plant bug is considered to be the culprit. Indeed, Hanny et al. (1977) reported that in greenhouse studies "the presence of tarnished plant bugs on presquaring cotton for only 3 days caused growth abnormalities resembling those observed in the field. The presence of tarnished plant bugs also delayed fruiting and hence crop maturity." Also, the tarnished plant bug is given key pest status because it infests cotton in the early squaring (fruiting) stage of growth. If infestations are severe enough at that time to justify control measures, the insecticides used will also reduce populations of beneficial insects, which leaves the crop more vulnerable to subsequent infestations of the bollworm, *Heliothis zea*

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(Boddie), and the tobacco budworm, *H. virescens* (F.).

Thus, a study of populations of the tarnished plant bug and *Heliothis* spp. was included in a 1977 prototype operation in Panola and Pontotoc Counties, Miss., to develop baseline data, refine techniques, and improve procedures for the Optimum Pest Management (OPM) Trial in Panola County, which was subsequently initiated in 1978 (Smith et al. 1978). Personnel of the Science and Education Administration, USDA, were given the responsibility of developing data for the biological evaluation of this trial and for conducting research to improve the components used in it. The results of this special study are reported herein.

METHODS AND MATERIALS

Twenty and ten well-distributed cottonfields were monitored weekly for insect populations in Panola and Pontotoc Counties, respectively. The Panola County fields were in the proposed OPM Trial area, and the Pontotoc County fields were in an area where it was proposed to compare a Current Insect Control (CIC) program with the OPM Trial. Four of the twenty fields in Panola County were planted to the nectariless cultivar 'Stoneville 731N', which was reported to have some tolerance to tarnished plant bugs because of its nectariless character (Meredith et al. 1973). The other 16 fields were planted to the nectaried cultivars 'Stoneville 213', 'DES 056', and 'DPL 61'. The 10 fields in Pontotoc County were planted to nectaried varieties only; they were 'Stoneville 213', 'DPL 16', and 'DPL 61'.

Insect and crop data were obtained as reported by Smith et al. (1978). However, the methods for collecting data relating to populations of tarnished plant bugs and *Heliothis* spp. are particularly pertinent, so they are described here. Numbers of tarnished plant bugs (adults and nymphs) were determined by vacuum-machine sampling and by examining plants.

Plants were examined on 50 feet of row at each of five locations in each field early in the season. When plants began to square, numbers of tarnished plant bugs and bollworm-tobacco budworm eggs and larvae were determined by examining plant terminals on 25 feet of row at each of five locations in each field. Also, bollworm-tobacco budworm larvae and damaged squares and bolls (after onset of blooming) were determined by examining 200 squares and 200 bolls (50 of each at

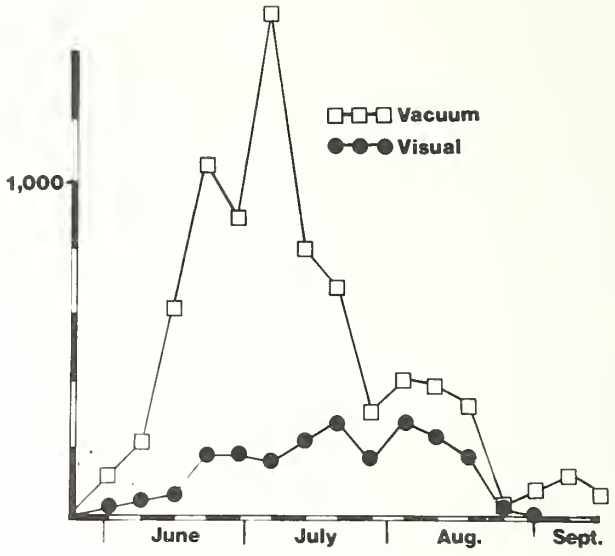

FIGURE 1.—Average weekly per-acre populations of tarnished plant bugs as determined by vacuum-machine sampling or visually examining cotton plants in all 20 fields, Panola County, Miss., 1977.

each of 4 locations) in each field. By using the number of row-feet required for each inspection, the insect populations and numbers of damaged fruiting forms could be computed on a per-acre basis.

The vacuum machine, equipped with a 25.4-centimeter cone, was used to take weekly samples of arthropod populations on plants in a total of 40 row-feet (10 row-feet at each of four locations) in each field. Samples were taken by vacuuming the entire surface of a plant while the operator moved slowly down the row. Tarnished plant bugs were counted in each sample, and populations were estimated on a per-acre basis. Decisions on whether insecticides would be applied were made by the producers.

Yields of cotton in the sampled fields were estimated by hand picking all bolls from plants on a total of 40 row-feet (10 row-feet at each of four locations) in each field. The weight of the seed cotton was converted to a per-acre value with a 33.3-percent lint factor.

Materials used in the counties were EPN plus methyl parathion, EPN plus methyl parathion plus *Bacillus thuringiensis* (DIPEL), EPN plus methyl parathion plus methomyl, EPN plus methyl parathion plus chlorpyrifos, methyl parathion, methyl parathion plus methomyl, monocrotophos, monocrotophos plus methomyl plus *Bacillus thuringiensis* (DIPEL), methomyl

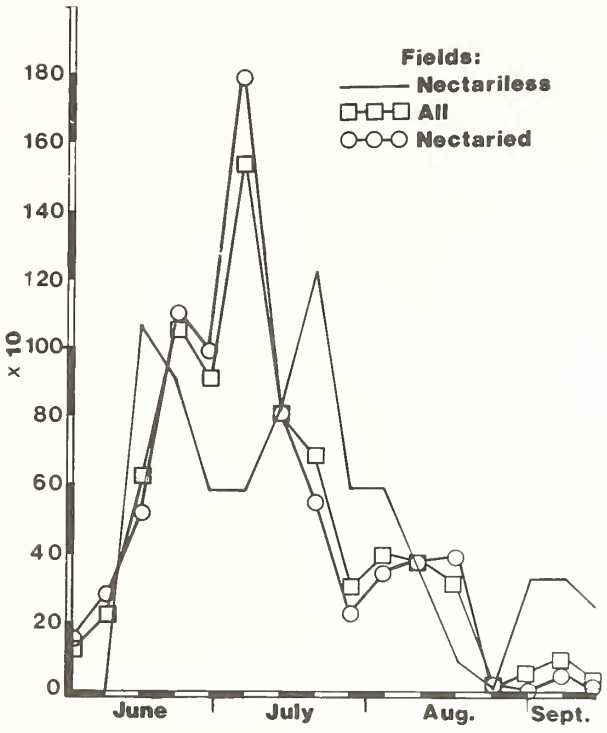

FIGURE 2. — Average weekly per-acre populations of tarnished plant bugs in 4 fields with a nectariless cultivar, in 16 fields with nectaried cultivars, and in all 20 fields, Panola County, Miss., 1977.

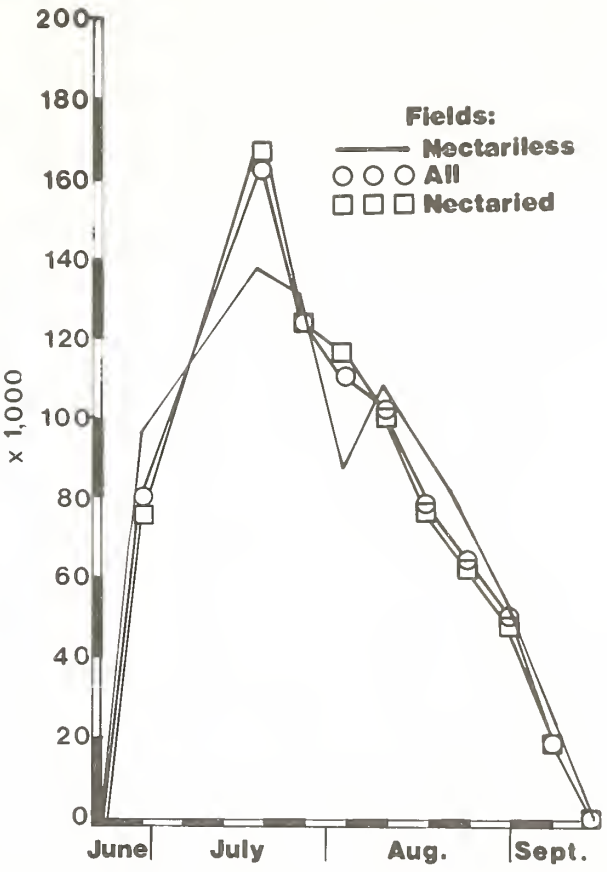

FIGURE 3. — Average weekly per-acre square production in 4 fields with a nectariless cultivar, in 16 fields with nectaried cultivars, and in all 20 fields, Panola County, Miss., 1977.

plus polyhedral virus (Elcar), fenvalerate (one field), and toxaphene plus methyl parathion.[2]

RESULTS AND DISCUSSION

TARNISHED PLANT BUG

Panola County. — Vacuum-machine sampling of tarnished plant bugs in Panola County was more efficient than visually inspecting plants, producing 3.5 times as many bugs (fig. 1). The period of greatest activity for the tarnished plant bug was between June 15 and July 20. Average weekly populations based on vacuumed samples from all fields, fields with the nectariless cultivar, and fields with the nectaried cultivars are shown in figure 2. Populations were somewhat lower in the nectariless cultivar, and the first population peak in these fields occurred June 15 instead of June 22, when a peak occurred in fields of nectaried cultivars. A second and larger population peak in the nectariless cultivar occurred July 20, but a considerably larger peak in the nectaried cultivars occurred July 6.

Comparative square (fruiting-bud) records of the cultivars are shown in figure 3. There was little difference between cultivars, though square production in the nectariless cultivar peaked earlier and then peaked again at the same time the nectaried cultivars peaked, but to a lesser extent. Boll production was similar in all cottonfields.

The relationship between fruiting and infestations of the tarnished plant bug can be seen from figure 4, which shows average weekly square pro-

[2]Chlorpyrifos, *O,O*-diethyl *O*-(3,5,6-trichloro-2-pyridyl) phosphorothioate. EPN, *O*-ethyl *O*-(*p*-nitrophenyl) phenylphosphonothioate. Fenvalerate, cyano(3-phenoxyphenyl)-methyl 4-chloro-α-(1-methylethyl)benzeneacetate. Methomyl, *S*-methyl *N*-[(methylcarbamoyl)oxy]thioacetimidate. Methyl parathion, *O,O*-dimethyl *O*-(*p*-nitrophenyl) phosphorothioate. Monocrotophos, dimethyl phosphate ester with (*E*)-3-hydroxy-*N*-methylcrotonamide. Toxaphene, chlorinated camphene containing 67 to 69 percent chlorine.

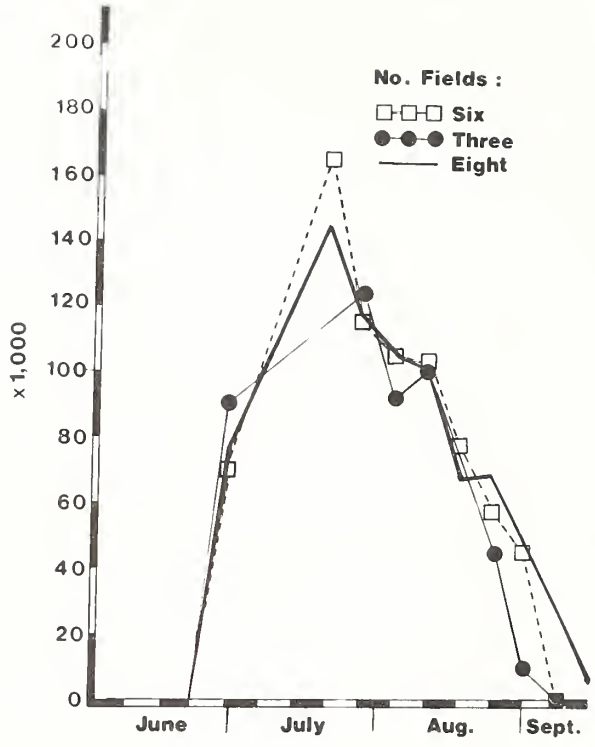

FIGURE 4. — Average weekly per-acre square production in six fields that did not exceed the action-level population of tarnished plant bugs, in three fields that exceeded it for 2 weeks, and in eight fields that exceeded it for 1 week, Panola County, Miss., 1977.

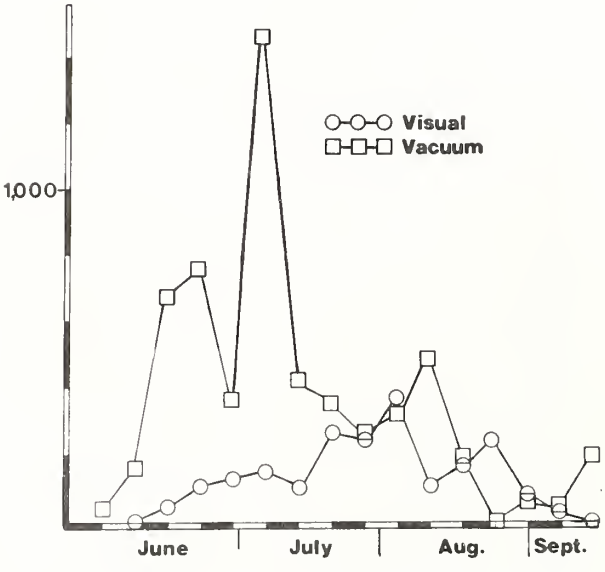

FIGURE 5. — Average weekly per-acre populations of tarnished plant bugs as determined by vacuum-machine sampling or visually examining cotton plants in all 10 fields, Pontotoc County, Miss., 1977.

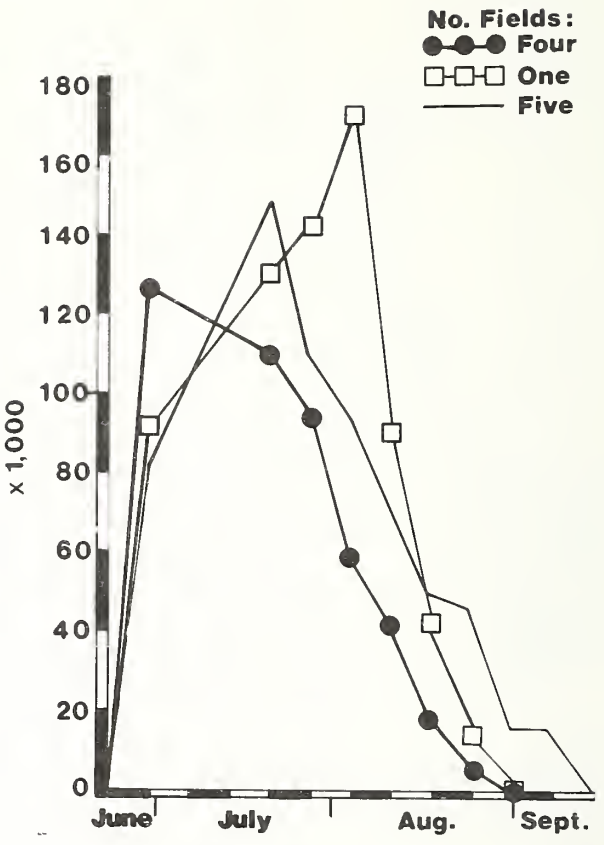

FIGURE 6. — Average weekly per-acre square production in four fields that did not exceed the action-level population of tarnished plant bugs, in one field that exceeded it for 1 week, and in five fields that exceeded it for 2 weeks, Pontotoc County, Miss., 1977.

duction for fields that did or did not exceed the action level (treatment level or economic threshold) of 1,500 bugs per acre (Lincoln 1978). (Although a higher population can be tolerated later in the season, the 1,500-per-acre figure was used throughout the season because populations were relatively low.) Peak square production occurred July 20 in six fields where populations of tarnished plant bugs did not exceed the action level and in eight fields where they exceeded it for only 1 week. In three fields where the population exceeded that level for 2 weeks, peak production occurred during the last week of July. Peak squaring in fields that exceeded the action level for 3 weeks (two fields) or 5 weeks (one field) occurred about 1 week later (not shown in figure 4). Squaring declined as the crop matured, and it ended about mid-September.

The number of insecticide treatments applied for bollworm-tobacco budworm control averaged 3.2 in the six fields with below-action-level infes-

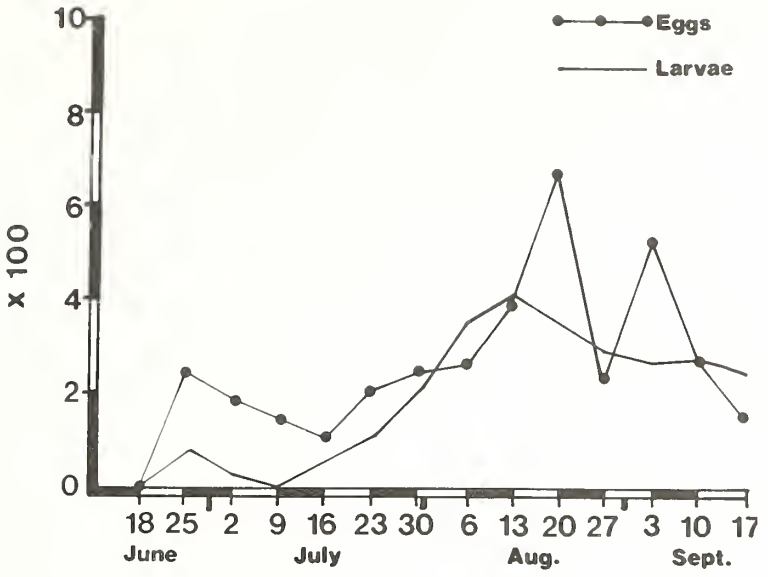

FIGURE 7. — Average weekly per-acre populations of bollworm-tobacco budworm eggs and larvae in terminal buds in all 30 cottonfields, Panola and Pontotoc Counties, Miss., 1977.

tations of tarnished plant bugs and 3.5 in the eight fields with populations of tarnished plant bugs exceeding the economic threshold for 1 week; only two of these fields were treated for control. Only one of the three fields where the action level was exceeded for 2 weeks was treated for tarnished plant bugs, but an average of 4.3 insecticide treatments was applied for bollworm-tobacco budworm control in these fields. Also, only one of the three fields where the tarnished plant bug exceeded the action level for 3 or 5 weeks was treated for these bugs, but an average of 3.7 treatments for bollworm-tobacco budworm control was applied in these fields. The four fields that were treated for tarnished plant bug control also received an average of 3.6 applications for bollworm-tobacco budworm control, and fields that did not receive treatment for tarnished plant bugs received an average of 3.2 applications for bollworm-tobacco budworm control.

Populations of tarnished plant bugs were either too low to affect yields or were overshadowed by the bollworm-tobacco budworm complex. In the 6 fields with below-action-level infestations of the tarnished plant bug the estimated yield was 1.5 bales per acre and in the remaining fields it was 1.6 bales per acre, the average yield for all 20 fields.

Pontotoc County. — In Pontotoc County, as in Panola County, vacuum-machine sampling was more efficient than visually inspecting plants, producing 2.9 times as many tarnished plant bugs (fig. 5). Again, the period of greatest activity for tarnished plant bugs began June 15, but it ended July 10, 10 days earlier than in Panola County. However, populations were considerably lower in Pontotoc County.

The peak of square production (fig. 6) in four fields with below-action-level infestations occurred June 29. It occurred July 20 in five fields where the action level was exceeded for 2 weeks and August 10 in one field where the action level was exceeded for 1 week.

None of the 10 fields was treated for control of the tarnished plant bug, and 3 fields were not treated for control of any insect pest. The seven treated fields received an average of 2.3 applications of insecticides for bollworm-tobacco budworm control. The estimated yields in the three untreated fields and the seven treated fields averaged 1.4 bales per acre. Thus, yields were slightly lower than in Panola County, but there was less rainfall in Pontotoc County.

BOLLWORM AND TOBACCO BUDWORM

In Panola County, bollworm-tobacco budworm infestations began to increase after the first week in August, and by mid-August all but one of the monitored fields had received at least one insecti-

cide application for bollworm control. The fields were then treated for the next several weeks. Applications were terminated in most of the fields between September 10 and 15, when cotton had matured. An average of 3.9 insecticide treatments per field were applied.

As stated above, the weather in Pontotoc County was somewhat drier than in Panola County. Bollworms became a problem in a few fields during the first week of August. The average number of insecticide treatments for the 10 fields, 7 treated and 3 untreated, was 1.6. The crop matured early, and most growers terminated treatment in mid-August.

Several comparisons were made by averaging the weekly data for all 30 fields. The seasonal relationship between *Heliothis* spp. eggs and larvae found in terminal buds is shown in figure 7. Peak egg population was about 650 per acre during the week of August 20. Peak larval population was slightly more than 400 per acre on August 13, when the egg population was also about the same. Generally, egg populations were slightly higher than larval populations, but they were considerably higher during the weeks of August 20 and September 3.

The relationship of populations of *Heliothis* spp. eggs and larvae to square damage is shown in figure 8. Egg population peaks of slightly more than 650 and 500 per acre occurred August 20 and September 3, and larval population peaks of about 1,000 and 1,500 per acre occurred July 16 and August 13. Damaged squares averaged 4,500 and 4,750 on the same dates. Thus, the ratio was slightly less than four damaged squares per larva, a figure very close to the 3.8 damaged squares per larva found by Adkisson et al. (1964) in replicated small-field plots. Also, the results support the data of these authors, who found little relationship between numbers of eggs deposited on cotton and surviving larvae. After August 13, larval population and square damage declined sharply as a

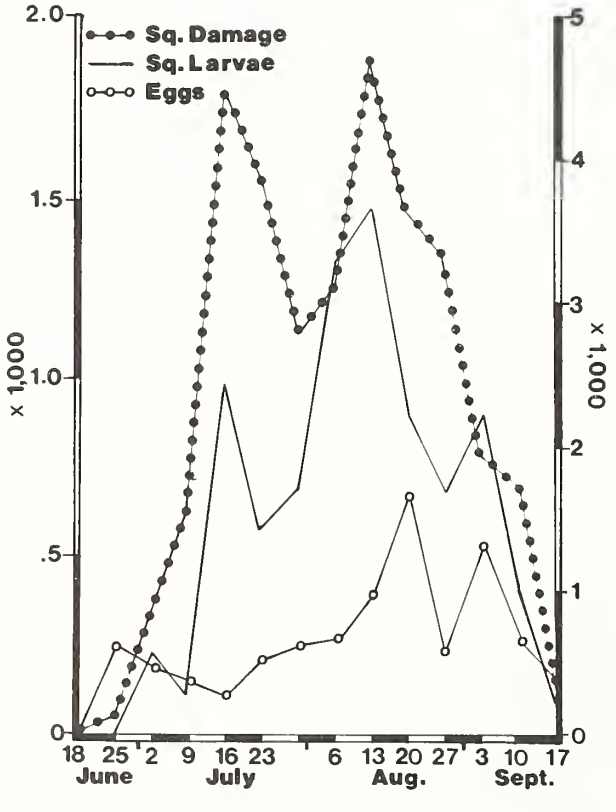

FIGURE 8.—Average weekly per-acre populations of bollworm-tobacco budworm eggs in terminal buds and larvae in squares (left) and numbers of damaged squares (right) in all 30 cottonfields, Panola and Pontotoc Counties, Miss., 1977.

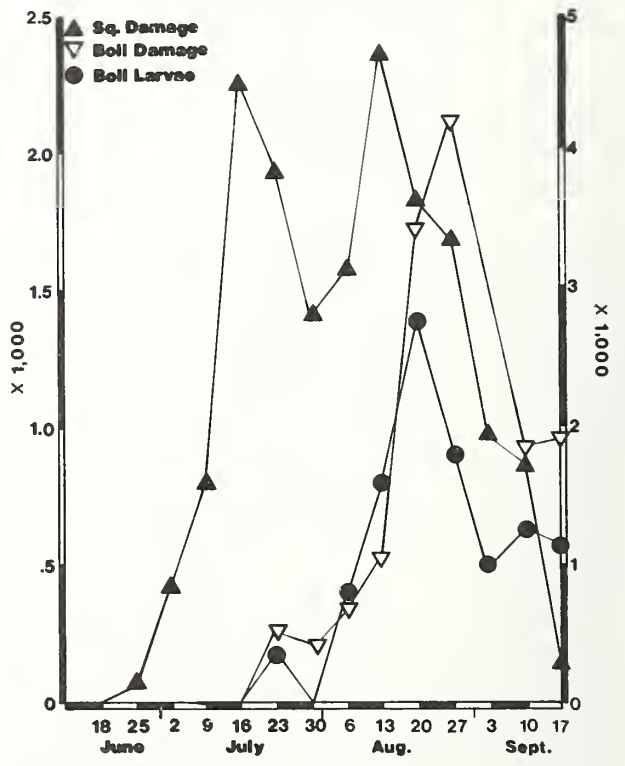

FIGURE 9.—Average weekly per-acre numbers of damaged squares and bolls (right) and populations of bollworm-tobacco budworm larvae in bolls (left) in all 30 cottonfields in Panola and Pontotoc Counties, Miss., 1977.

result of the applications of insecticides and the maturation of plants.

Relationships among damaged bolls, larval populations, and damaged squares are shown in figure 9. Peak larval population in bolls of about 1,000 per acre occurred August 20, and peak damage to bolls of about 4,250 per acre occurred 1 week later on August 27. The average was slightly more than four damaged bolls per larva, which was similar to that found in squares. The two peaks in damaged squares were 4,500 per acre July 16 and 4,750 per acre August 13, as could be expected 2 weeks before the peak for damaged bolls.

Adkisson et al. (1964) estimated that an average of 2,000 to 2,500 *Heliothis* spp. larvae (or approximately 1.5 to 2.0 per 10 feet of row) per acre is required to cause significant yield losses to cotton. Larval populations did not reach this average in the 30 fields we studied, though they did reach or exceed it in some fields at some time during the season. The few insecticide applications required in most fields indicate that bollworm-tobacco budworm infestations were light to moderate. As previously stated, averages of 3.9 and 1.6 applications of insecticides per field were made in Panola and Pontotoc Counties, respectively.

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